



REPORT ON HIV RISK FACTORS AMONG INFANTS IN THE JOE GQABI HEALTH DISTRICT OF THE EASTERN CAPE PROVINCE

Prepared for



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by

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Table of Contents

CONTRIBUTORS	2
LIST OF TABLES.....	55
ACRONYMS.....	66
GLOSSARY OF TERMS	77
FEEDING PRACTICES THAT WOULD LEAD TO A HEALTHY, WELL-GROWN, ABLE, LIVE, HIV-FREE CHILD WHO HAS NO UNDERLYING MORBIDITY RESULTING FROM INCORRECT FEEDING PRACTICES.	77
EXECUTIVE SUMMARY	88
1. INTRODUCTION AND BACKGROUND	1010
2. OBJECTIVES OF THE STUDY	1212
3. METHODOLOGY	1212
3.1. DESIGN AND STUDY SITE	1212
FIGURE 4: MAP OF JOE GQABI HEALTH DISTRICT	1313
3.2. SAMPLING.....	1313
3.3. DATA COLLECTION METHODS.....	1515
3.4. DATA ANALYSIS.....	1515
3.5. ETHICAL CONSIDERATIONS	1515
4 RESULTS.....	1616
4.8. FACTORS ASSOCIATED WITH PCR TESTING AND CONCERN ABOUT INFECTING BABIES	2323
5. PERCEIVED RISK FACTORS IDENTIFIED AND RECOMMENDATIONS.....	2525
7. CONCLUSION	2727

List of Tables

TABLE 1:	LIST OF CLINICS IN JOE QQABI DISTRICT MUNICIPALITY.....	<u>139</u>
TABLE 2:	SELECTED CLINICS IN JOE QQABI DISTRICT	<u>1410</u>
TABLE 3:	NUMBER OF PARTICIPANTS PER CLINIC AND OR CLINIC AREA	<u>1510</u>
TABLE 4:	RELATIONSHIP OF RESPONDENTS TO BABY.....	<u>1612</u>
TABLE 5:	SOCIO-DEMOGRAPHIC CHARACTERISTICS.....	<u>1612</u>
TABLE 6:	BIOLOGICAL RISK FACTORS.....	<u>1713</u>
TABLE 7:	RECEIVED COUNSELING DURING ANC AND PNC.....	<u>1814</u>
TABLE 8:	FEEDING OPTIONS COUNSELED ON.....	<u>1814</u>
TABLE 9:	FEEDING OPTIONS BEING PRACTICED	<u>1914</u>
TABLE 10:	TIMING OF INITIATING BREASTFEEDING.....	<u>1914</u>
TABLE 11:	FREQUENCY OF BREASTFEEDING IN A DAY	<u>1915</u>
TABLE 12:	IN THE FIRST THREE DAYS AFTER DELIVERY, WERE ANY OF THE FOLLOWING GIVEN TO THE BABY TO DRINK?.....	<u>2015</u>
TABLE 13:	DO YOU HAVE ANY OF THE FOLLOWING?.....	<u>2015</u>
TABLE 14:	KNOWLEDGE ABOUT HIV TRANSMISSION AND PREVENTION.....	<u>2115</u>
TABLE 15:	SOCIO-CULTURAL RISK FACTORS	<u>2116</u>
TABLE 16:	SEXUAL RISK FACTORS	<u>2216</u>

Acronyms

AFASS	Acceptable, feasible, affordable, sustainable and safe
AIDS	Acquired Immunodeficiency syndrome
ANC	Antenatal Care
EBF	Exclusive breastfeeding
EFF	Exclusive Formula Feeding
ECAC	Eastern Cape AIDS Council
ECDOH	Eastern Cape Department of Health
EMS	Emergency Medical Service
ECSECC	Eastern Cape Socio Economic Consultative Council
HAST	HIV/AIDS/STI/TB
HEI	HIV Exposed Infants
HIV	Human Immunodeficiency virus
HSRC	Human Sciences Research Council
IEC	Information Education & Communication
MCP	Multiple Concurrent Partnership
MF	Mixed Feeding
MTCT	Mother to Child Transmission
NSP	National Strategic Plan
PCR	Polymerase chain reaction
PHC	Primary Health Care
PMTCT	Prevention of Mother-to-Child Transmission of HIV
PNC	Postnatal Care
REC	Research Ethics committee
SAHARA	Social Aspects of HIV/AIDS Research Alliance

Glossary of Terms

Exclusive breastfeeding or exclusive breast milk feeding

Feeding practice in which an infant receives only breast milk and no other liquids or solids, including water, but may receive drops or syrups consisting of vitamins, mineral supplements, or medicines that are deemed necessary and essential for the child. When expressed milk is given, the preferred term is breast milk feeding.

Exclusive formula feeding

Feeding practice in which infants receive no breast milk, but receive a diet that provides adequate nutrients until the age at which they can be exclusively fed family foods. During the first 6 months of life, formula feeding requires a suitable commercial formula. After 6 months, complementary foods should be introduced.

Gravida

Number of times the mother has been pregnant, regardless of whether these pregnancies were carried to term

HIV-exposed infant:

Infant born to an HIV-positive woman.

Infant

A person from birth to 12 months of age.

Mixed feeding

Feeding breast milk as well as other milks (including commercial formula or home-prepared milk), foods, or liquids.

Mother-to-child transmission

Transmission of HIV from an HIV-positive woman to her child during pregnancy, delivery, or breastfeeding. The term is used because the immediate source of the infection is the mother, and does not imply blame on the mother.

Parity

Number of live births a woman has had in her lifetime

Replacement feeding

Feeding of infants who are receiving no breast milk with a diet that provides adequate nutrients until the age at which they can be exclusively fed on full family foods. During the first 6 months of life, formula feeding should be with a suitable commercial formula. After 6 months, complementary foods should be introduced.

Safe infant feeding

Feeding practices that would lead to a healthy, well-grown, able, live, HIV-free child who has no underlying morbidity resulting from incorrect feeding practices.

Executive Summary

Background

Risk factors associated with the non-vertical transmission of HIV in infants have not been conclusively studied. Empirical research continues to be used to explore potential risk factors for the non-vertical transmission of HIV in this age group. This study was commissioned by the ECAC to investigate the potential risk factors for non-vertical HIV transmission that could explain the inordinately high prevalence of HIV among infants born HIV negative but subsequently sero-converting during infancy in the Joe Gqabi District Municipality of the Eastern Cape Province of South Africa.

Methods

A cross-sectional survey was carried out in 15 randomly-selected primary health care facilities in three sub-district areas (Elundini, Maletswai and Senqu sub-districts) within Joe Gqabi District Municipality. A purposive sample of 230 participants was interviewed using a structured questionnaire. All responses were captured and analyzed using STATA 11. Ethical approval for the study was secured from the Research Ethics Committee of the Human Sciences Research Council (HSRC) prior to commencement of the study.

Results

A variety of perceived risk factors were found to explain the relatively higher prevalence of non-vertical transmission of HIV in infants in Joe Gqabi District Municipality.

- Poor maternal education: The majority of participants had no tertiary education (79%) and 17.5% had no education at all.
- Lack of basic necessities: More than 50% were without shelter, electricity, clean water, medicines, food and cash.
- Infant feeding: An overwhelming majority of women (95.0%) had received both pre and postnatal infant feeding counselling. They acknowledged that they had been taught about infant feeding options including exclusive breastfeeding (87.4%) and exclusive formula feeding (65.1%). About 40% indicated that they practiced exclusive formula feeding and 66.5% practiced exclusive breastfeeding. It is also interesting to note that about 43% acknowledged that they were mixed feeding. In addition, 73% of participants reported that they gave plain water to their babies, 64% indicated that they gave them gripe water and about 30% gave them sugar water, traditional herbs, infant formula and other non-breast milk products respectively in the first three days of delivery. About 10% had nipple lesions, engorgements and burning pain on their breasts respectively.
- Poor HIV transmission Knowledge: Whilst participants were generally knowledgeable in some aspects, i.e., using condoms while breastfeeding (78.0%) and correctly reported that an HIV+ mother can infect her baby through breastfeeding (76.11%); a sizeable proportion indicated that HIV cannot be prevented through exclusive formula feeding (33.0%) and exclusive breastfeeding (47.0%) for six months.

- Sexual risk behaviour: between 39-50% of the participants reported that they had sex after the baby was born, did not abstain, they did not use condoms, did not communicate or rarely communicated with partners on sexual issues and that about 18% practiced Multiple Concurrent Sexual Partnerships (MCP).
- Missed opportunities: the data from the clinic records shows that some of the exposed babies were not given Cotrimoxazole following PCR, e.g. 4 out of 11 exposed babies received it; 7 were missed, thus increasing their susceptibility to contracting HIV.

Recommendations

Based on the findings of this study, the following recommendations can be made for the identified risk factors;

- Given the low levels of maternal education, women would probably need continuous empowerment on HIV prevention education.
- It might be helpful to consider economic empowerment of women through cash-transfer related projects. This would be to address the problems of unemployment and inadequacy of basic needs such as clean water, electricity and medicines.
- There is great need to support women in making choices for infant feeding. This would include addressing practical challenges in implementing either exclusive breastfeeding or exclusive formula feeding.
- The low levels of HIV-transmission knowledge may be addressed through designing and implementing effective Information, Education and Training (IEC) programmes. Further, the content of the PMTCT Programme needs to address this ongoing challenge.
- Male (or partner) involvement during PNC and ANC could alleviate sexual risk factors such as inconsistent condom use and MCP.
- Tracing of HIV Exposed Infants (HEI) needs to be strengthened in order to minimize missed opportunities for early management and enrollment on care. All HEIs should be given cotrimoxazole at the time of PCR testing in order to minimize risks of HIV infection.
- We recommend that an evidence-based HIV prevention programme addressing the identified perceived risk factors be designed based on the results of this study, implemented and evaluated.

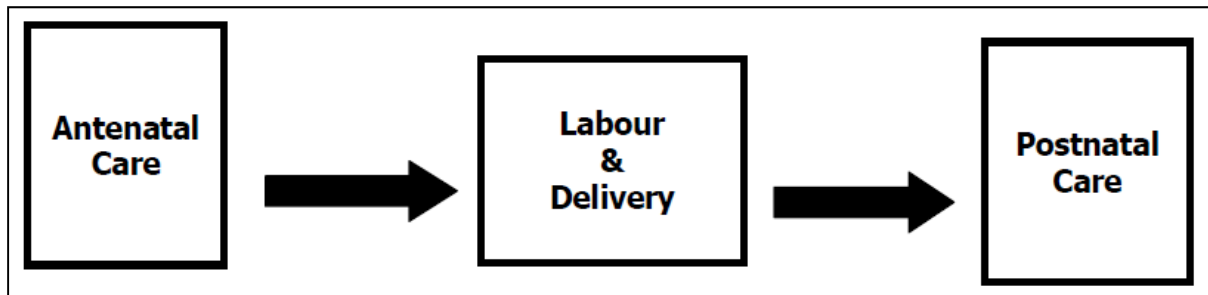
1. Introduction and Background

The risk factors associated with non-vertical transmission of HIV/AIDS have not been identified conclusively, and further empirical research is needed to identify them. In a review of published evidence on HIV prevalence in paediatric health care settings in Africa, risks for horizontal transmission in African children exposed to health care settings mainly depend on the viral load, the specific procedures involved, and the care taken to implement infection control and universal precautions (Gisselquist *et al*, 2004). Other factors contributing to non-vertical transmission include use of HIV-infected wet nursing, accidental switching of babies at birth and sexual abuse (Hiemstra *et al*, 2003). Considering the low efficiency of HIV transmission through sexual exposure- even for child rape (Brody *et al*, 2003; Lindegren *et al*, 1998; Van As *et al* 2001) - sexual abuse and premature sexual activity cannot explain more than exceptional cases; similarly, infected wet nurses and switching of babies are unlikely to account for more than rare cases. A study by Shisana, *et al* targeting children 2-9 years old in Free State, South Africa, the first of its kind in sub-Saharan Africa, provided evidence on nosocomial infections (hospital and dental care) in children in South Africa. The study also identified the cultural risk factors in understanding HIV infection in children. Additional evidence suggestive of healthcare-related infections is based on a limited number of random surveys. Empirical evidence is needed on risk factors associated with non-vertical transmission of HIV/AIDS. Risk factors, including: hygiene practices and safety of medical equipment in health and dental facilities; breastfeeding of children by non-biological mothers; safety of blood supplies; child sexual abuse in the family and neighborhood context, or in relation to sex tourism; and some traditional medical practices.

Other risk factors included in other studies include parity, gravida, multiple-births, home delivery, and oral candidiasis (Humphrey *et al* 2010; Embree *et al* 2000). In South Africa in 2006, an estimated 38 000 children acquired HIV infection around the time of birth and an additional 26 000 children were infected through breastfeeding (UNAIDS, 2005). In terms of feeding options, HIV infected women are recommended to exclusively breastfeed their babies for 6 months, unless formula feeding is acceptable, feasible, affordable, sustainable and safe - AFASS (NDoH 2007; NDoH & SANAC 2010). Mixed feeding during the first six months is strongly discouraged, as it increases the risk of childhood infections (PMTCT National Guidelines 2010). In the absence of AFASS conditions, it is recommended that breastfeeding continues (in combination with complementary feeding) after six months (Kuhn *et al*. 2007). In recent years, it has been shown that exclusive breastfeeding carries a lower risk of HIV transmission than mixed feeding, leading to increasing promotion of exclusive breastfeeding in resource-constraint settings (Doherty *et al*. 2003; Coovadia *et al*. 2007; Piwoz *et al*. 2007). Infant feeding patterns are a very important determinant of mother to child transmission (MTCT). For mothers using replacement feeding there is obviously no transmission through breastfeeding. Globally, renewed efforts are required to increase access to comprehensive, integrated programmes to prevent HIV infection in infants and young children and to use antenatal and postnatal services as an opportunity for women to access services to improve their own health.

In South Africa, the (National Strategic plan) NSP and the revised PMTCT guidelines (NDoH & SANAC 2010) provide a major impetus for reducing missed opportunities for PMTCT. The section below presents an overview of the PMTCT flow chart and then a focus on postnatal follow-up and care

Figure 1: Summary of PMTCT processes



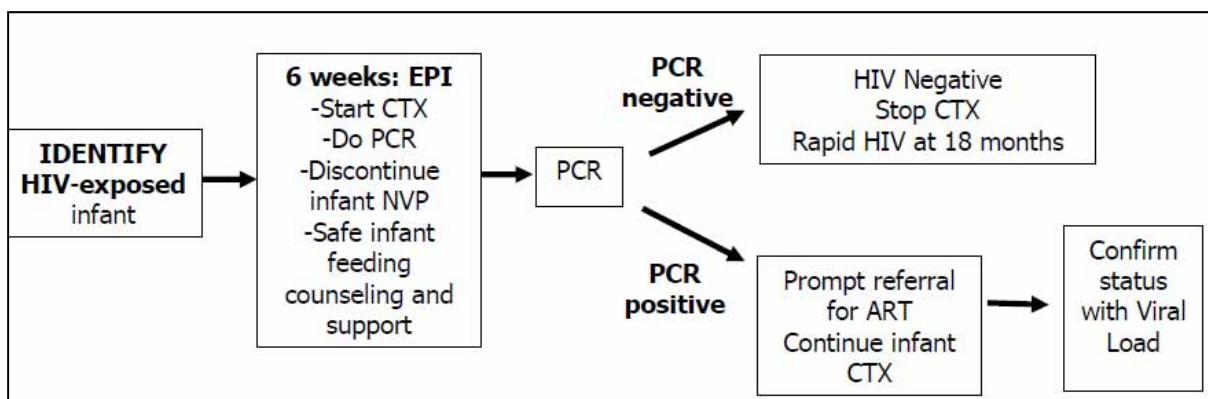
(Source: NDoH & SANAC, 2010)

The following are the goals of postnatal follow-up of mother and infant

- Provide follow-up post-partum care including a postnatal visit within 3 days
- Improve the quality of the mother's health and reduce mortality by including family planning counselling and cervical cancer screening where applicable
- Provide post-exposure prophylaxis for infants
- Reduce postnatal HIV transmission through breastfeeding
- Identify all HIV-exposed infants
- Reduce mortality in HIV-exposed infants
- Identify all HIV-positive infants *and* start ART early

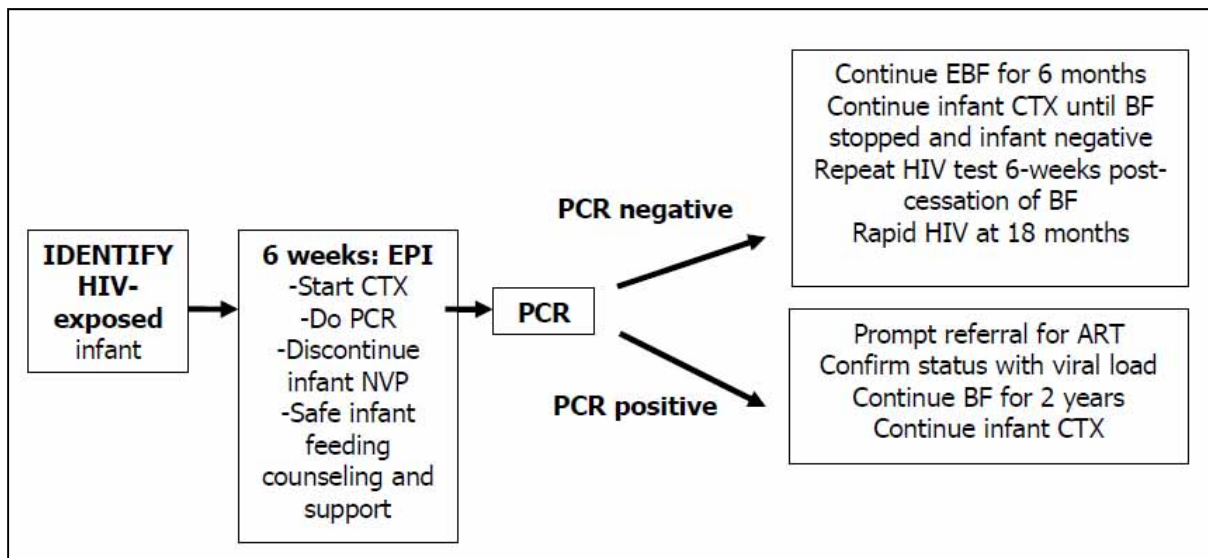
Figure below shows the algorithm of management of infants who are exclusively formula fed, whilst Figure presents the same for infants who are exclusively breast fed and whose mothers are on lifelong ART.

Figure 2: Infants who are exclusively formula fed



(Source: NDoH & SANAC, 2010)

Figure 3: Infants who are exclusively breastfed whose mothers are on lifelong ART



(Source: NDoH & SANAC, 2010)

This report presents risk factors that predispose infants born HIV negative to HIV infection from 6 weeks post-delivery to 12 months in 15 clinics within the Joe Gqabi District Municipality (previously Ukahlamba District) of the Eastern Cape Province.

2. Objectives of the study

- To determine risk factors that predispose infants born HIV negative to develop HIV infection from 6 weeks after birth to 12 months.
- To review health facility registers in order to identify babies born HIV-negative, but who sero-converted in the first year of their life.

3. Methodology

3.1. Design and Study site

A cross-sectional survey design was employed for this study. The study was conducted in 15 PMTCT-providing primary health care facilities in the Joe Gqabi District Municipality of the Eastern Cape Province (see Map below). This District was chosen because of the recent high infant mortality reported in its health facilities. Interviews were conducted with new mothers (those with children between six weeks and one year of age), or guardians of these infants, to identify factors that may put their infants at risk of contracting HIV. In addition, health facility registers were used to identify babies born HIV-negative, but who later sero-converted in their first year of life.

Figure 4: Map of Joe Gqabi Health District



3.2. Sampling

Systematic random sampling was used to select 15 out of 51 eligible clinics. The following steps were followed to come up with a sample of 15 clinics;

1. A total listing of all the clinics in each sub-District of Joe Ngabi District was obtained.
2. Exclusion of the following type of facilities from the list was done:
 - a. Mobile service clinics
 - b. District Hospitals
 - c. Satellite clinics
 - d. Emergency Medical Service (EMS) Stations

Table 1: List of clinics in Joe Qqabi District Municipality

Sub District	Total (ALL Facilities)	Excluded (Type & #)		Total 'Eligible'	Weights	# Needed per sub district
Elundini Health sub-District	29	District Hospital	2	21	0.41	6
		EMS Station	2			
		Mobile Service	4			
		sub-Total	8			
Maletswai Health sub-District	29	District Hospital	5	12	0.24	4
		EMS Station	5			
		Mobile Service	5			
		Satellite Clinic	2			
		sub-Total	17			
Senqu Health sub-District	35	District Hospital	4	18	0.35	5
		EMS Station	3			
		Mobile Service	8			
		Satellite Clinic	2			
		sub-Total	17			
Total	93	Total	42	51	1	15

3. The number of remaining ‘eligible’ facilities per sub-district is shown in Table 1 above. In total there were 51 clinics from which 15 were selected
4. The total number of clinics needed per sub-district was determined proportionally to, or as, weighted averages of the ‘eligible’ size. These are shown in the last column.
5. Finally, to decide on/select the clinics from the ‘eligible’ list, each clinic was assigned a number between 1 and highest per each respective sub-district. Random number tables were used to randomly pick the clinics. Taking Elundini sub-district for example, the ‘eligible’ clinics were numbered from 1-21. Using the random number tables, the first 6 numbers (or clinics) appearing within this range were selected.
6. The selected clinics per sub-district are shown below in Table 2 below.

Table 2: Selected clinics in Joe Qqabi District

SUBDISTRICT	CLINIC (s)
Elundini Health sub-District	Lower Tsitsana Clinic
	Maclear Clinic
	Mangoloaneng Clinic
	Mqokolweni Clinic
	Ncembu Clinic
	Seqhobong Clinic
Maletswai Health sub-District	Aliwal North Block H Clinic
	Khayamnandi Clinic
	Maletswai Clinic
	Steynsburg Clinic
Senqu Health sub-District	Esilindini Clinic
	Herschel Clinic
	Ndofela Clinic
	Pelandaba Clinic
	Umlamli Gateway Clinic

Convenience sampling was used to recruit participants. In each health facility, trained researchers provided a brief explanation of the study to all clinic attendees in the clinic waiting area and volunteers were interviewed. This was done to avoid the unintended disclosure of maternal HIV status and that of their babies. Once volunteers presented themselves, an in-depth explanation of the study was provided to each participant. Each participant was asked to sign a written informed consent prior to their participation in interviews. In addition, several households were visited to interview mothers who had not visited the clinic on the research team visit day. They were interviewed after consenting to participate in the study in writing. Overall, a purposive sample of 230 new mothers participated in the study as shown in Table 3:

Table 3: Number of participants per clinic and or clinic area

Sub-District	Clinic	No. of Questionnaires done
Elundini Health sub-District	Lower Tsitsana Clinic	15
	Maclear Clinic	16
	Mangoloaneng Clinic	15
	Mqokolweni Clinic	17
	Ncembu Clinic	15
	Seqhobong Clinic	15
Maletswai Health sub-District	Aliwal North Block H Clinic	17
	Khayamnandi Clinic	15
	Maletswai Clinic	15
	Steynsburg Clinic	15
Senqu Health sub-District	Esilindini Clinic	15
	Herschel Clinic	15
	Ndofela Clinic	15
	Pelandaba Clinic	15
	Umlamli Gateway Clinic	15
Total		230

3.3. Data Collection methods

Interviews were conducted using a structured questionnaire in the local language (). Each interview lasted for approximately 30 minutes. In addition, health facility registers were reviewed to identify babies born HIV-negative, but who sero-converted aged 6 weeks to 12 months.

3.4. Data Analysis

Data was captured and analyzed by trained personnel using STATA 11. Descriptive and inferential statistics have been used to answer the research question.

3.5. Ethical considerations

Ethical approval was obtained from the HSRC Research Ethics Committee. The participants were assured that their names will not be recorded on either the oral or written reports in order to ensure their confidentiality. No monetary incentive was provided to avoid the possibility of participants agreeing to participate solely for financial gain and also to protect participants from being labeled as “information sellers”. In this regard, each participant signed a written consent form. Permission to conduct the study was obtained from the Eastern Cape Department of Health and the Joe Qqabi District Municipality.

4 Results

This section presents the results from this study. Background characteristics of the surveyed sample are presented first, followed by a description of the postnatal HIV risk factors prevalent in Joe Gqabi district. Associations were explored between HIV proxy variables (PCR testing which is done to infants of HIV exposed mothers and having concerns about transmitting HIV to own baby) and other variables in the study.

4.1. Relationship of the respondents to the baby

Most of the respondents interviewed (57%) were biological mothers of the infants and a majority of them (65.2%) cared for the babies on a day to day basis (Table 4).

Table 4: Relationship of respondents to baby

	Relationship to baby		Baby cares from day-day	
	N	%	N	%
Guardian	42	18.26	30	13.04
Helper	6	2.61	3	1.3
Mother	131	56.96	150	65.22
Relative	51	22.17	47	20.43
TOTAL	230	100	230	100

4.2. Socio-demographic characteristics

The majority of the respondents were not married (64.8%), had no tertiary education (79.4%) and 17.5% had no education at all.

Most of the respondents were unemployed (86.9 %) and more than 50% had gone without electricity, clean water, medicines, food and cash, whilst 40% had gone without shelter at one time or another

Table 5: Socio-demographic characteristics

	N	%
Age of Respondents (Mean; Range)	36	(16;86)
Current marital status		
Married/Stable union	80	35.24
Not Married	147	64.76
Level of education		
None	39	17.49
Primary School Completed	74	33.18
High School Completed	103	46.19
College/Pre-University/University	7	3.14
Employment status		
Employed	30	13.1
Not employed	199	86.9
Race		

	N	%
African	223	97.81
Coloured	4	1.75
White	1	0.44
Sex of babies		
Female	149	65.35
Male	79	34.65
Age of Babies (Mean; Range)	7.1	(1;12)
Ever gone without;		
Shelter	90	39.65
Fuel or electricity	150	66.08
Clean water	142	62.56
Medicines	128	56.39
Food to eat	128	56.39
Cash income	133	58.59

4.3. Biological Risk Factors

The prevalence of risk factors such as parity, gravida, baby having a twin, home delivery, baby suffering from oral candidiasis, was generally low across sub-districts (Table 6). The prevalence of protective factors such as PCR testing at six weeks, known HIV status, HIV-testing of the mother, baby being born full-term was generally more than 80%.

Table 6: Biological risk factors

	Elundini N (%)	Maletswai N (%)	Senqu N (%)	Total N (%)
Parity				
One	53 (60.9)	24 (42.9)	42 (57.5)	119 (55.1)
Two or more	34 (39.1)	32 (57.1)	31 (42.5)	97 (44.9)
Gravida				
One	54 (62.07)	25 (45.45)	43 (58.11)	122 (56.48)
Two or more	33 (37.93)	30 (54.55)	31 (41.89)	94 (43.52)
Baby twin/triplet				
Yes	4 (4.49)	7 (12.5)	2 (2.67)	13 (5.91)
No	85 (95.51)	49 (87.5)	73 (97.33)	207 (94.09)
Baby full-term				
Yes	82 (92.13)	53 (91.38)	67 (88.16)	202 (90.58)
No	7 (7.87)	5 (8.62)	9 (11.84)	21 (9.42)
Mode of delivery				
Vaginal	70 (79.55)	50 (87.72)	64 (84.21)	184 (83.26)
Cesarean section	18 (20.45)	7 (12.28)	12 (15.79)	37 (16.74)
Birth place				
At home	4 (4.44)	1 (1.72)	1 (1.33)	6 (2.69)
Public clinic	84 (93.33)	56 (96.55)	72 (96)	212 (95.07)
Private clinic	2 (2.22)	1 (1.72)	2 (2.67)	5 (2.24)
Baby ever had oral candidiasis				
Yes	13 (14.44)	11 (19.3)	10 (13.16)	34 (15.25)

	Elundini N (%)	Maletswai N (%)	Senqu N (%)	Total N (%)
No	77 (85.56)	46 (80.7)	66 (86.84)	189 (84.75)
Baby PCR at 6wks				
Yes	64 (82.05)	44 (75.86)	56 (86.15)	164 (81.59)
No	14 (17.95)	14 (24.14)	9 (13.85)	37 (18.41)
Mother tested for HIV during ANC				
Yes	80 (97.56)	57 (100)	61 (96.83)	198 (98.02)
No	2 (2.44)	0 (0)	2 (3.17)	4 (1.98)
Knows HIV status				
Yes	79 (96.34)	56 (98.25)	62 (98.41)	197 (97.52)
No	3 (3.66)	1 (1.75)	1 (1.59)	5 (2.48)
Concerned about infecting baby				
Yes	46 (59.74)	30 (52.63)	40 (62.5)	116 (58.59)
No	31 (40.26)	27 (47.37)	24 (37.5)	82 (41.41)

4.4. Infant Feeding

4.4.1. Infant feeding counseling

An overwhelming majority of women across the sub districts had received both pre (95.0%) and postnatal (92.4%) infant feeding counselling.

Table 7: Received Counseling during ANC and PNC

	Elundini N (%)	Maletswai N (%)	Senqu N (%)	Total N (%)
ANC				
Yes	75 (93.75)	56 (98.25)	57 (93.44)	188 (94.95)
No	5 (6.25)	1 (1.75)	4 (6.56)	10 (5.05)
PNC				
Yes	72 (90)	52 (92.86)	58 (95.08)	182 (92.39)
No	8 (10)	4 (7.14)	3 (4.92)	15 (7.61)

4.4.2. Infant feeding options counseled on

The participants acknowledged that they had been taught about infant feeding options including exclusive breastfeeding (EBF) (87.4%) and exclusive formula feeding (EFF) (65.1%) (Table 8).

Table 8: Feeding options counseled on

	Elundini N (%)	Maletswai N (%)	Senqu N (%)	Total N (%)
Exclusive Formula Feeding	52 (60.47)	37 (67.27)	45 (69.23)	134 (65.05)
Exclusive Breast Feeding	72 (83.72)	51 (92.73)	57 (87.69)	180 (87.38)
Cup Feeding	47 (54.65)	32 (58.18)	28 (43.08)	107 (51.94)
Mixed feeding	45 (52.33)	28 (50.91)	28 (43.08)	101 (49.03)
Not offered	3 (3.49)	7 (12.73)	3 (4.62)	13 (6.31)

4.4.3. Infant feeding counseling options practiced

Of the 134 (65.1%) participants who acknowledged being counseled on EFF in the three sub-districts, 87 (40.1%) indicated that they practiced this form of infant feeding while 145 (66.5%) of the 180 (87.4%) who were counseled on EBF actually practiced this form of infant feeding (Table 9). There was no significant difference in percentages of participants who practised EBF in the Senqu and Elundini sub-districts, 70.0% and 68.9%, respectively. It is also interesting to note that 92 (43%) participants practised mixed feeding.

Table 9: Feeding options being practiced

	Elundini N (%)	Maletswai N (%)	Senqu N (%)	Total N (%)
Exclusive Formula Feeding	22 (24.44)	29 (50.88)	36 (51.43)	87 (40.09)
Exclusive Breast Feeding	62 (68.89)	34 (58.62)	49 (70.0)	145 (66.51)
Mixed feeding (breast milk and solid foods)	31 (34.44)	19 (33.33)	25 (35.71)	75 (34.56)
Mixed feeding (breast milk and non-human milk)	4 (4.44)	6 (10.53)	7 (10.0)	17 (7.83)
Other	4 (4.44)	2 (3.51)	3 (4.29)	9 (4.15)

4.4.4. Timing of initiating breastfeeding

An overwhelming majority (79.4%) across feeding options (EBF and MF) and sub-districts had initiated breastfeeding within the first hour, which is in line with the policy guidelines - Baby-Friendly Hospital Initiative (BFHI).

Table 10: Timing of initiating breastfeeding

	Elundini N (%)	Maletswai N (%)	Senqu N (%)	Total N (%)
< 1 hr	47 (83.93)	25 (80.65)	28 (71.79)	100 (79.37)
1 - 8 hrs	3 (5.36)	2 (6.45)	5 (12.82)	10 (7.94)
>8hrs, <1day	4 (7.14)	2 (6.45)	2 (5.13)	8 (6.35)
> 1 day	2 (3.57)	2 (6.45)	4 (10.26)	8 (6.35)

4.4.5. Frequency of breastfeeding in a day

When the number of times the participants breastfed their babies was taken into account, the majority of the participants (60.8%) breastfed less than 7 times per day (Table 11). A comparison amongst the three sub-districts showed that Senqu had a higher percentage of participants who breastfed less than seven times a day (64.5%).

Table 11: Frequency of breastfeeding in a day

	Elundini N (%)	Maletswai N (%)	Senqu N (%)	Total N (%)
< 7	41 (56.94)	24 (61.54)	36 (65.45)	101 (60.84)
8 to 10	17 (23.61)	9 (23.08)	8 (14.55)	34 (20.48)
> 10	14 (19.44)	6 (15.38)	11 (20.0)	31 (18.67)

4.4.6. Feeding of baby three days after delivery

When the participants across the three sub-districts were asked whether they had given their babies any other drinking stuff other than breastmilk, 159 (73.3%) reported that they gave plain water to their babies, 64.5% indicated that they gave them gripe water and 34.6% gave them sugar water, traditional herbs (32.7%), infant formula (27.8%) and other non-breast milk foods in the first three days of delivery.

Table 12: Drinking substances given to babies in the first three days after delivery

	Elundini N (%)	Maletswai N (%)	Senqu N (%)	Total N (%)
Milk (other than breast milk)	15 (16.85)	18 (32.14)	17 (23.61)	50 (23.04)
Plain water	67 (75.28)	38 (67.86)	54 (75)	159 (73.27)
Sugar or glucose water	25 (28.09)	24 (42.86)	26 (36.11)	75 (34.56)
Gripe water	57 (64.04)	36 (64.29)	47 (65.28)	140 (64.52)
Traditional herbs	31 (34.83)	15 (26.79)	25 (34.72)	71 (32.72)
Infant formula	26 (29.55)	17 (30.36)	17 (23.61)	60 (27.78)
Honey	4 (4.55)	7 (12.5)	0 (0)	11 (5.09)

4.4.7. Breast health problems experienced

Regarding breast health problems experienced by the participants, 22 (11.3%) had burning pain, 21 (10%) had nipple lesions while 19 (9.8%) had engorgements (Table 13). The rest of breast health problems cited were significantly small.

Table 13: Do you have any of the following?

Positive responses	Elundini N (%)	Maletswai N (%)	Senqu N (%)	Total N (%)
Nipple lesions	8 (9.64)	9 (19.15)	4 (6.15)	21 (10.77)
Mastitis	0 (0)	1 (2.08)	2 (3.17)	3 (1.55)
Abcess	1 (1.2)	2 (4.17)	1 (1.59)	4 (2.06)
Engorgements	13 (15.66)	4 (8.33)	2 (3.17)	19 (9.79)
Burning (tingling)	11 (13.25)	8 (16.67)	3 (4.76)	22 (11.34)

4.5. Knowledge about HIV transmission and prevention

Whilst participants were generally knowledgeable in some aspects, i.e. using condoms while breastfeeding (78.0%) and correctly reported that an HIV positive mother can infect her baby through breastfeeding (76.1%), a sizeable proportion indicated that HIV cannot be prevented through exclusive formula feeding (32.8%) and exclusive breastfeeding (47.0%) for six months.

Table 14: Knowledge about HIV transmission and prevention

	Elundini N (%)	Maletswai N (%)	Senqu N (%)	Total N (%)
Can HIV be prevented by:				
Avoiding breastfeeding?				
Yes	47 (64.38)	36 (62.07)	43 (84.31)	126 (69.23)
No	26 (35.62)	22 (37.93)	8 (15.69)	56 (30.77)
Exclusive Breastfeeding Feeding for 6m				
Yes	42 (59.15)	25 (43.86)	28 (54.9)	95 (53.07)
No	29 (40.85)	32 (56.14)	23 (45.1)	84 (46.93)
Exclusive Formula Feeding				
Yes	51 (71.83)	28 (48.28)	42 (82.35)	121 (67.22)
No	20 (28.17)	30 (51.72)	9 (17.65)	59 (32.78)
Using condoms whist breastfeeding				
Yes	53 (74.65)	44 (78.57)	41 (82)	138 (77.97)
No	18 (25.35)	12 (21.43)	9 (18)	39 (22.03)
Can HIV+ mother infect her baby through breastfeeding				
Yes	50 (70.42)	46 (79.31)	41 (80.39)	137 (76.11)
No	21 (29.58)	12 (20.69)	10 (19.61)	43 (23.89)

4.6. Socio-cultural risk factors

About eight babies (3.6%) were reported to have been scarified (traditional marks), whilst three girls (1.4%) were circumcised and two boys (0.9%) were sterilized (vasectomy). Pricking by a traditional healer was reported to have been done on 2 babies.

Table 15: Socio-cultural risk factors

Positive responses	Elundini N (%)	Maletswai N (%)	Senqu N (%)	Total N (%)
Vasectomy (Male sterilization)	1 (1.08)	0 (0)	1 (1.35)	2 (0.9)
Female circumcision	1 (1.08)	0 (0)	2 (2.74)	3 (1.35)
Tribal marks/scarification	6 (6.45)	0 (0)	2 (2.74)	8 (3.6)
Pricking or Injected by traditional healer	0 (0)	0 (0)	2 (2.74)	2 (0.9)
Ever Wet nursed	2 (2.27)	2 (3.92)	1 (1.43)	5 (2.39)

4.7. Sexual risk factors

Across the three sub-districts, more than half (52.4%) of the participants reported that they had been sexually active since the baby was born, did not abstain (50.7%), did not use condoms (45.6%), did not or rarely communicated with partners on sexual issues (38.7%), while 17.6% practiced Multiple Concurrent Sexual Partnerships (MCP) (Table 16).

Table 16: Sexual risk factors

	Elundini N (%)	Maletswai N (%)	Senqu N (%)	Total N (%)
Sexually active since birth of baby				
Yes	38 (55.88)	28 (54.9)	22 (44.9)	88 (52.38)
No	30 (44.12)	23 (45.1)	27 (55.1)	80 (47.62)
Partner characteristics				
Husband (Baby's father)	30 (62.5)	24 (66.67)	22 (70.97)	76 (66.09)
Regular Partner	15 (31.25)	10 (27.78)	8 (25.81)	33 (28.7)
Other	3 (6.25)	2 (5.56)	1 (3.23)	6 (5.22)
Used condoms				
Yes	27 (54)	22 (52.38)	19 (57.58)	68 (54.4)
No	23 (46)	20 (47.62)	14 (42.42)	57 (45.6)
Practices abstinence				
Yes	28 (46.67)	25 (53.19)	22 (53.66)	75 (50.68)
No	32 (53.33)	22 (46.81)	19 (46.34)	73 (49.32)
Multiple Concurrent Partners				
Yes	7 (11.29)	7 (15.56)	12 (29.27)	26 (17.57)
No	55 (88.71)	38 (84.44)	29 (70.73)	122 (82.43)
Communication with partner on sexual matters				
Yes	35 (62.5)	25 (56.82)	27 (64.29)	87 (61.27)
No	21 (37.5)	19 (43.18)	15 (35.71)	55 (38.73)
Frequency of communication				
Very Often	6 (16.22)	9 (28.13)	4 (16.67)	19 (20.43)
Often	18 (48.65)	6 (18.75)	12 (50)	36 (38.71)
Rarely	13 (35.14)	17 (53.13)	8 (33.33)	38 (40.86)

4.8. Indicators for sero-conversion obtained from clinic records

According to the PMTC Guidelines (2010), all HIV Exposed Infants (HEI) should be started on Cotrimoxazole at the time of conducting PCR testing. Of the 13 clinics with data collected, only 4 (Mangoloaneng, Esilindini, Umlamli Gateway and Maletswai) had met this requirement. Ncembu and Pelandaba clinics had only 1 baby recorded to be given Cotrimoxazole out of 19 and 21 who should have, respectively. In some cases, more babies were given Cotrimoxazole than PCR tested (Aliwal North Block H and Mzamomhle). These discrepancies may either be a result of misreporting of data at facility level or actual missed

opportunities for babies to be PCR tested or receive Cotrimoxazole which increases susceptibility to contracting HIV. Prompt administration of treatment may contribute towards further reduction of the risk of HIV infection among babies.

Table 17: Indicators for sero-conversion obtained from clinic records

Indicator	Lower Tsitsana	Mangoloaneng	Ncembu	Seqhobong	Esilindini	Herschel	Ndofela	Pelandaba	Umlamli Gateway	Alwal North Block H	Khayammandi	Maletswai	Mzamomhle
Baby initiated on CTX	4	18	1	3	26	34	23	1	60	30	15	43	21
Baby PCR around 6 weeks	11	18	19	5	26	36	36	21	60	29	17	43	8
<i>Baby PCR Positive around 6 weeks</i>	0	0	0	0	0	0	1	0	0	1	0	0	1
<i>Baby PCR Negative around 6 weeks</i>	11	18	24	5	26	36	35	1	60	29	17	37	18
Baby receiving supplementary feeding	1	1	0	1	15	0	23	60	12	6	17	5	0

4.8. Factors associated with PCR testing and concern about infecting babies

Mothers whose babies underwent PCR testing were less likely to practice mixed feeding compared to those whose babies did not. There were no significant associations between proxy HIV+ status and other potential risk factors.

Table 18: Association between various factors and PCR testing

	PCR Testing (Maternal HIV+ proxy)		p-value
	Yes N (%)	No N (%)	
Parity			
Once	85 (81)	20 (19)	0.992
Two or more	72 (80.9)	17 (19.1)	
Gravida			
Once	88 (82.2)	19 (17.8)	0.578
Two or more	68 (79.1)	18 (20.9)	
Twins/Triplets			
Yes	9 (81.8)	2 (18.2)	0.952
No	150 (81.1)	35 (18.9)	
Full Term Pregnancy			
Yes	151 (83)	31 (17)	0.032
No	11 (64.7)	6 (35.3)	
Delivery			
Vaginal	133 (81.1)	31 (18.9)	0.2588
Caesarean	28 (84.8)	5 (15.2)	
Birth Weight			
< 2.5 kg	20 (74.1)	7 (25.9)	0.830
≥ 2.5 kg	70 (76.1)	22 (23.9)	
Oral Candidiasis			
Yes	23 (74.2)	8 (25.8)	0.254
No	140 (82.8)	29 (17.2)	

Nipple Lesions			
Yes	17 (89.5)	2 (10.5)	0.391
No	128 (81.5)	29 (18.5)	
Engorgement			
Yes	16 (88.9)	2 (11.1)	0.473
No	129 (82.2)	28 (17.8)	
Burning/Tingling			
Yes	17 (89.5)	2 (10.5)	0.418
No	128 (82.1)	28 (17.9)	
Feeding Problems			
Yes	7 (70)	3 (30)	0.416
No	141 (80.6)	34 (19.4)	
EFF			
Yes	28 (75.7)	9 (24.3)	0.911
No	59 (76.6)	18 (23.4)	
EBF			
Yes	53 (81.5)	12 (18.5)	0.131
No	34 (69.4)	15 (30.6)	
Mixed Feeding: BM and Solids			
Yes	5 (50)	5 (50)	0.020
No	82 (78.8)	22 (21.2)	

Significant associations were observed between being concerned about infecting baby in future and the following factors; parity ($p=0.0023$), gravida ($p=0.042$), condom use ($p=0.005$), abstinence ($p=0.001$), burning/tingling of breasts ($p=0.001$) and multiple partners ($p=0.009$). The sample size for the last two variables (burning/tingling of breasts and multiple partners) is relatively small to make valid inferences and further investigations are recommended to establish these relationships.

Table 19: Factors associated with concern about infecting babies

	Concerned about infecting baby in future?		p-value
	Yes N (%)	No N (%)	
Parity			
Once	65 (63.7)	37 (36.3)	0.023
Two or more	44 (49.4)	45 (50.6)	
Gravida			
Once	65 (62.5)	39 (37.5)	0.042
Two or more	43 (50)	43 (50)	
Twins/Triples			
Yes	8 (61.5)	5 (38.5)	0.791
No	104 (57.8)	76 (42.2)	
Full Term Pregnancy			
Yes	98 (55.4)	79 (44.6)	0.015
No	16 (84.2)	3 (15.8)	
Delivery			
Vaginal	94 (58.8)	66 (41.3)	0.533
Caesarean	18 (52.9)	16 (47.1)	
Birth Weight			
< 2.5 kg	16 (61.5)	10 (38.5)	0.617
≥ 2.5 kg	51 (56)	40 (44)	
Oral Candidiasis			
Yes	18 (60)	12 (40)	0.893
No	98 (58.7)	69 (41.3)	
Nipple Lesions			
Yes	12 (60)	8 (40)	0.851

No	59 (38.3)	65 (42.2)	
Engorgement			
Yes	11 (61.1)	7 (38.9)	0.804
No	90 (58.1)	65 (41.9)	
Burning/Tingling			
Yes	18 (90)	2 (10)	0.001
No	83 (54.2)	70 (45.8)	
EFF			
Yes	23 (60.5)	15 (39.5)	0.430
No	39 (52.7)	35 (47.3)	
EBF			
Yes	37 (57.8)	27 (42.2)	0.546
No	25 (52.1)	23 (47.9)	
Intercourse since birth			
Yes	48 (55.8)	38 (44.2)	0.808
No	45 (57.7)	33 (42.3)	
Condom use			
Yes	40 (59.7)	27 (40.3)	0.005
No	27 (48.2)	29 (51.8)	
Abstinence since birth			
Yes	51 (68.9)	23 (31.1)	0.001
No	34 (47.9)	37 (52.1)	
Multiple sexual Partner			
Yes	20 (80)	5 (20)	0.009
No	65 (54.2)	55 (45.8)	
Knowledgeable			
Yes	74 (57.4)	55 (42.6)	0.338
No	23 (50)	23 (50)	

5. Perceived risk factors identified and recommendations

The prevalence of risk factors such as parity, gravida, baby having twin, home delivery, baby suffering oral candidiasis, was generally low across sub-districts. The prevalence of protective factors such as PCR at six weeks, known HIV status, HIV testing of the mother, baby born full term was generally more than 80%. Below are the key risk factors identified and the recommendations thereof:

- Poor maternal education: The majority of participants had no tertiary education (79.0%) while 17.5% had no education at all. Maternal education has been included in several studies as a background independent variable for postnatal HIV transmission e.g. maternal education was found to be associated with postnatal HIV transmission in studies conducted by Embree et al (2000) & Tawengwa et al (2007). These women would probably need continuous empowerment on HIV prevention education.
- Lack of basic necessities: More than 50% had gone without shelter, electricity, clean water, medicines, food and cash. Previous studies have shown that women with less education, living in houses with no electricity and having no water source were more likely to mix-feed (Coutsoudis et al. 1999). It might be helpful to consider economic empowerment of women through cash transfer related projects.
- Infant feeding: An overwhelming majority of women (95.0%) had received both pre and postnatal infant feeding counselling. They acknowledged that they had been taught

about infant feeding options including EBF (87.4%) and EFF (65.1%). About 40% indicated that they practiced EFF and 66.5% practiced EBF. Further analyses need to be done to determine association between EFF and EBF and potential biological risk factors. It is also interesting to note that about 43% acknowledged that they were mixed feeding. Mixed feeding can be attributed to the fact that they ran out of basic necessities like water, electricity, food, medicines and cash. Further analyses need to be conducted to determine associations between mode of infant feeding and socio-demographic characteristics. In addition, 73% of participants reported that they gave plain water to their babies, 64% indicated that they gave them gripe water and about 30% gave them sugar water, traditional herbs, infant formula and other non-breast milk respectively in the first three days of delivery. Again, this provides some level of inconsistency when comparing it with the self-reported EBF and EFF. About 10% had nipple lesions, engorgements and burning pain on their breasts respectively. Previous studies found that maternal nipple lesions were significant risk factors of postnatal HIV infection (OR=2.3, CI 95% 1.1-5.0). Breast health has also been associated with the risk of transmission through breastfeeding, with breast pathologies such as clinical and subclinical mastitis, nipple bleeding, abscess or fissures relatively common in HIV-infected populations (*Semba et al. 1999b; Willumsen 2001; Willumsen 2003*). Nipple lesions have been detected in 10–13% of HIV infected mothers in several cohort studies (*Embree et al. 2000; John et al. 2001; Ekpini et al. 2002*). Mastitis, abscess, and nipple lesions have all been associated with a relative increase in the risk of transmission through breastfeeding (*Embree et al. 2000; Willumsen 2000; John et al. 2001; Willumsen 2003*). The findings on infant feeding suggest the need for dedicated and in-depth support in the area of infant feeding.

- Poor HIV transmission Knowledge: Whilst participants were generally knowledgeable in some aspects, i.e., using condoms while breastfeeding (78.0%) and correctly reported that HIV positive mother can infect her baby through breastfeeding (76.11%); a sizeable proportion indicated that HIV cannot be prevented through EFF (33.0%) and EBF (47.0%) for six months. The latter is interesting to note given the fact that the majority of women had indicated that they had been counselled on these infant feeding options. This begins to suggest that the quality of training and the level of the level of understanding of the participants about the counseling they received may be limited and this may be attributed to their relatively lower levels of education. The Information , Education and Training (IEC) materials and the PMTCT need to address this ongoing challenge.
- Sexual risk behaviour: More than half (52.4%) of the participants reported that they had sex after the baby was born, did not abstain, they did not use condoms, , did not communicate or rarely communicated with partners on sexual issues yet about 18% practiced Multiple Concurrent Sexual Partnerships (MCP). The involvement of partners during PNC and ANC could alleviate this sexual risk behaviour.
- Missed opportunities: The data from the clinic records show that some of the exposed babies were not given Cotrimoxazole following PCR whilst some of the babies given Cotrimoxazole did not have PCR done. HIV exposed babies missed for Cotrimoxazole

may be more susceptible to contracting HIV. Prompt administration of treatment may contribute towards reduction of the risk of HIV infection among babies. Further, data management at facility level needs to be strengthened to enhance tracing of HIV exposed babies.

6. Strengths and limitations of the study

6.1. Strengths of the study

- The sample size of the study is sufficiently large
- The use of mixed methods (interviews combined with clinic records) strengthens the quality of the dataset.
- The random selection of clinics in the district prevented selection bias.
- The comprehensiveness of the questionnaire using previously-validated measures and the collection of data within the same time period over a short space of time (one week) may have contributed to prevention of factors that could have confounded the results.

6.2. Limitations of the study

- Information on the HIV status of the mother and the baby was not recorded due to ethical considerations. The absence of this information makes it difficult to determine causal relationships. However, the information collected from clinic records and from HIV proxy variables (PCR testing and concern about infecting baby) additional information indicative of the HIV status of the mothers.
- Although facilities were randomly selected to ensure district representativity, participants were chosen purposively to participate in the study. Therefore, the results of this study cannot be generalized to all women. However, the sample size of 230 women is sufficient to determine the risk factors required in this study.
- There could have been an information bias due to the fact that the responses were self-reported. However, this shortcoming was complemented through the use of the clinic records.

7. Conclusion

Pediatric HIV remains an important public health problem in HIV high-burden countries, with more than 90% of new HIV infections in children occurring through mother-to-child-transmission (MTCT) (Global Expanded Inter-agency Task Team on prevention of HIV in pregnant women, 2007). Prevention of new HIV infections is a critical imperative for South Africa, and PMTCT is one of the most effective HIV prevention interventions. In order to reduce missed. The risk factors identified in this study to the need to strengthen the formal health sector in infant feeding, infant follow-up as well as reduce missed opportunities as has also been found in other studies (Rispel *et al*, 2009). Community support to provide psychosocial support to mothers may also contribute to improvements in reducing MTCT.

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